

**THE REDUCTION OF DEFECT ON LABEL PRINT OPERATION
IN HARD DISK DRIVE ASSEMBLY THROUGH LEANCONCEPT**

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A master project report submitted

**As a partial fulfillment of the requirements for the degree of Master of
Manufacturing Engineering (System Engineering)**

Faculty of Manufacturing Engineering

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2014

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA

TAJUK: THE REDUCTION OF DEFECT OF LABEL PRINT OPERATION IN HARD DISK DRIVE ASSEMBLY THROUGH LEAN CONCEPT

SESI PENGAJIAN: 2013/14 Semester 4

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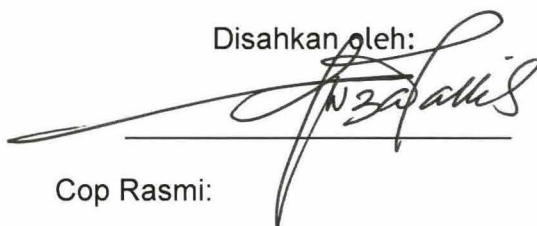
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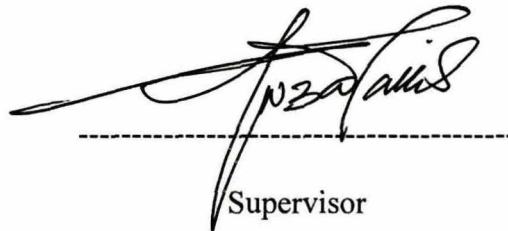
DECLARATION

I hereby, declared this master project report entitled “The Reduction of Defect Of Label Print Operation In Hard Disk Drive Assembly Through Lean Concept” is the result of my own research except as cited in references.

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APPROVAL

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DEDICATION

For my family, thank you for all the support and patience.

ABSTRACT

There are various types of waste available in production line. In Toyota Production System the seven wastes consist of overproduction, inventory, transportation, over processing, defect, waiting and motion. The existing of waste will affect the performance of the organization. Therefore waste elimination is very significant in order to ensure the productivity and efficiency at the optimum level. A case study has been conducted at a hard disk drive company XYZ in order to study manufacturing waste reduction through lean concept. According to the report, company XYZ weekly scrap is more than RM44, 000. This high product label defect rate is impacting the organization productivity performance. In order to ensure on product quality and on time delivery to customer the reduction of defect rate is a must. This paper seeks to investigate what is the current waste at label print operation and provide recommendations to reduce product label scrap. Lean practice such as waste elimination and Genchi Gembutsu was applied along the way to achieve process improvement. A pilot run has been carried out in order to validate on the effectiveness of the proposed method before high volume production. The statistical result showed that the corrective action that taken is significant therefore can be applied across all label print station.

ABSTRAK

Terdapat pelbagai jenis pembaziran yang boleh didapati di dalam operasi pengeluaran. Di dalam Sistem Pengeluaran Toyota terdapat tujuh jenis pembaziran yang telah dikenal pasti iaitu pengeluaran berlebihan, inventori, pengangkutan, pemrosesan berlebihan, kecacatan, penunggulan dan gerakan. Pengurangan pembaziran adalah sangat penting untuk memastikan produktiviti dan kecekapan di peringkat optimum. Satu kajian kes telah dijalankan di cakera keras kilang pembuatan di Petaling Jaya untuk mengkaji pengurangan pembaziran melalui teknik lean. Menurut laporan XYZ, kos mingguan pembuangan melebihi RM44, 000. Quantiti pembaziran yang tinggi ini memberi impak ke atas prestasi produktiviti organisasi. Di dalam usaha untuk memastikan kualiti produk dan mengurangkan masa penghantaran kepada pelanggan pengurangan kadar kecacatan adalah satu kemestian. Kertas kerja ini bertujuan untuk menyiasat jenis pembaziran yang terdapat di kilang dan memberikan cadangan untuk memperbaiki keadaan. Amalan Lean seperti penghapusan pembaziran dan Genchi gembutsu telah digunakan di sepanjang kajian untuk mencapai penambahbaikan proses. Punca dan analisis kesan telah dipilih untuk menyiasat punca pembaziran. Eksperimen telah dilakukan untuk mengesahkan keberkesanan kaedah yang dicadangkan sebelum penukaran process. Result statistik telah mengesahkan keberkesanan kaedah baru oleh itu kaedah baru akan dijalankan di semua station pencetakan label.

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LIST OF ABBREVIATIONS

FMEA	-	Failure Mode and Effect Analysis
TPS	-	Toyota Production System

CHAPTER 1

INTRODUCTION

1.1 Background

Waste is defined as an unusable object that no further use as for the own purpose and required to discard (Pearsall, 1998). According to Shingo (1989), waste is an activity that does not contribute to operation and add value to product. Meanwhile value added activity transforms raw material into product by manufacturing process.

In Japanese, the word “muda” means waste. Tersine (2004) stated that waste elimination can be one of the most effective ways to increase profit margin of a business where profit can be increased while costs reduced. Masaaaki (2012) also stated that muda elimination can be the most cost effective ways to improve manufacturing productivity and at the same time reduce operating cost. It would be better to emphasize on the elimination of waste rather than increase the investment in the hope of adding value. Crute and Graves (2011) criticized that traditional business perspective management seem to be more focus on cost reduction instead of waste reduction.

Therefore manufacturer should focus more on long term waste elimination in manufacturing line and maximize the value added activities instead of focusing on yearly price reduction only as to achieve higher profit margin.

Perfection is a nonstop work towards total elimination of waste so that all activities are value added (Womack and Jones, 2007). The work on improvement should start from the point during receive customer order till payment (Womack and Jones, 2003).

Many organizations faced difficulties on flexibility. Traditional mass production system is unable to cope with urgent order with special requirement, because the preparation time is very long and expensive (Yang and Yu, 2010). To secure in a competitive market, the company must able to reduce cost by eliminating waste and at the same time increase the quality of product. Therefore lean approach was considered to be one of the most recommended approaches to improve organization performance.

The next section of this research study will discuss on what type of waste that is currently badly impacting the organization and how lean concept can be applied to a hard disk drive manufacturing company. The final goal of the study is to reduce waste as to help on achieving operational excellent in manufacturing and sustainable business excellent in organizational performance.

1.2 Problem Statement

With the cost of raw materials apparently not going down any time soon, waste and scrap reduction has ever been more important for manufacturers. In manufacturing, wastes are those that do not add value to product as per customer perspective and what customer not willing to pay (Taiichi Ohno, 1988).

Normally cost is incurred and time is wasted therefore customers left with unpleasant condition. Therefore waste and scrap costs are manufacturing reality that impacting organizations across all industries. Most of the time waste and scrap cost can be caused by many root causes such as tools worn out and damage the product in the manufacturing line, wrong method on equipment calibration and human error.

No matter why these non value added activity occurs, its impact on an organization is always the same which is wasted time, money, and possibly organization's reputation. Better manufacturing processes and cost effective in materials management, especially in prevention of scrap generation, can improve manufacturer's competitive level.

Competitiveness of today in market is measured in terms of on time delivery and product quality that meet customer requirements. With the pressure of today's just-in-time cycles, manufacturing defect or inefficiencies can become greatly magnified and eat profit margins.

Company XYZ weekly label scrap cost is more than RM 44,000. This scrap cost is purely referred to scrap label that generated in the label print. This high scrap cost really impacting the organization therefore an in depth study has to be carried out. Product label is a label that will be pasted on the top cover of the hard disk drive.

Product information such as capacity, model type, product serial number, year of manufacture will be printed on the product label.

According to the report the scrap label can be breakdown into few categories as shown in Figure 1.1.

1. Misalignment – Product label pasted misalign on top cover
2. Vendor – Incoming defect label from supplier
3. Illegible print – Void label that printed out from printer
4. Calibration – Label that printed out for printer calibration purpose
5. Visual Manual Inspection – Label send to scrap due to defect found on product during visual manual inspection process

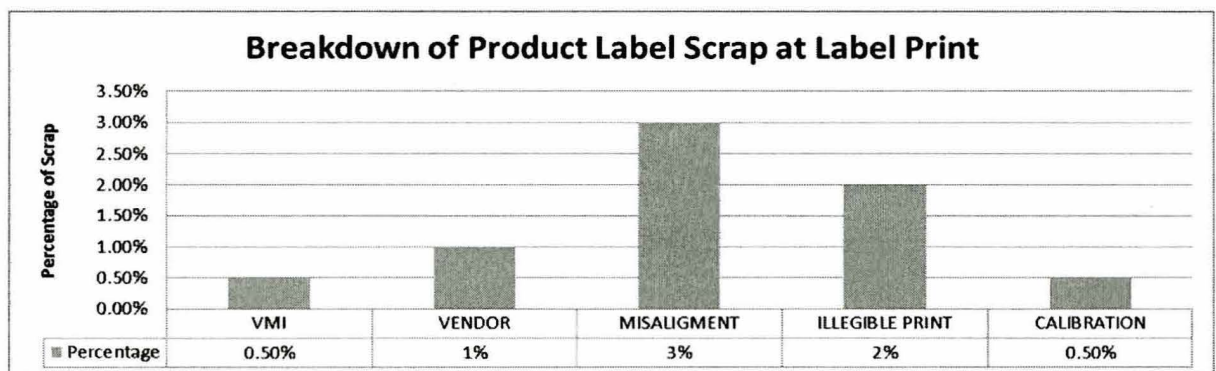


Figure 1.1: Breakdown of Product Label Scrap at Label Print

1.3 Objectives

This research is an in depth study of the reduction of defect label at the Label Print operation in hard disk drive assembly process. The objectives of this research are to:

1. Investigate current waste at label print operation
2. Provide recommendation to reduce combo label scrap
3. Simulate the recommended method as to verify the effectiveness of the reduction

1.4 Scope of Study

A case study has been conducted at company XYZ. The study focused at Label Print operation. For every defect that is produced, no matter it can be reworked or not, a saleable product is lost. All these costs increase if the problem is not resolved. Therefore the research study sought to investigate the waste of defect, identify all the root causes and provide effective countermeasures to reduce waste. A task force team which consists of process, equipment, and manufacturing team from company XYZ was form to help on the case study.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Waste and scrap occurred in every manufacturing process and this including hard disk drive assembly process. Value added activities are activities that directly transform the parts to product that customer willing to pay. Non value added activities are activities that doesn't transform any part or any value to the final goods and therefore should be eliminated. Non value added but necessary are those activities that do not create value but can't be eliminated based on current production condition due to some limitation. By understanding this three types of task can help to eliminate unnecessary work and help to improve the overall process. (Womack and Jones, 2003)

2.1.1 Introduction to Hard Disk Drive

Main component of hard disk drive is as shown in Figure 2.1 and functionality of each component is explained in Table 2.1.

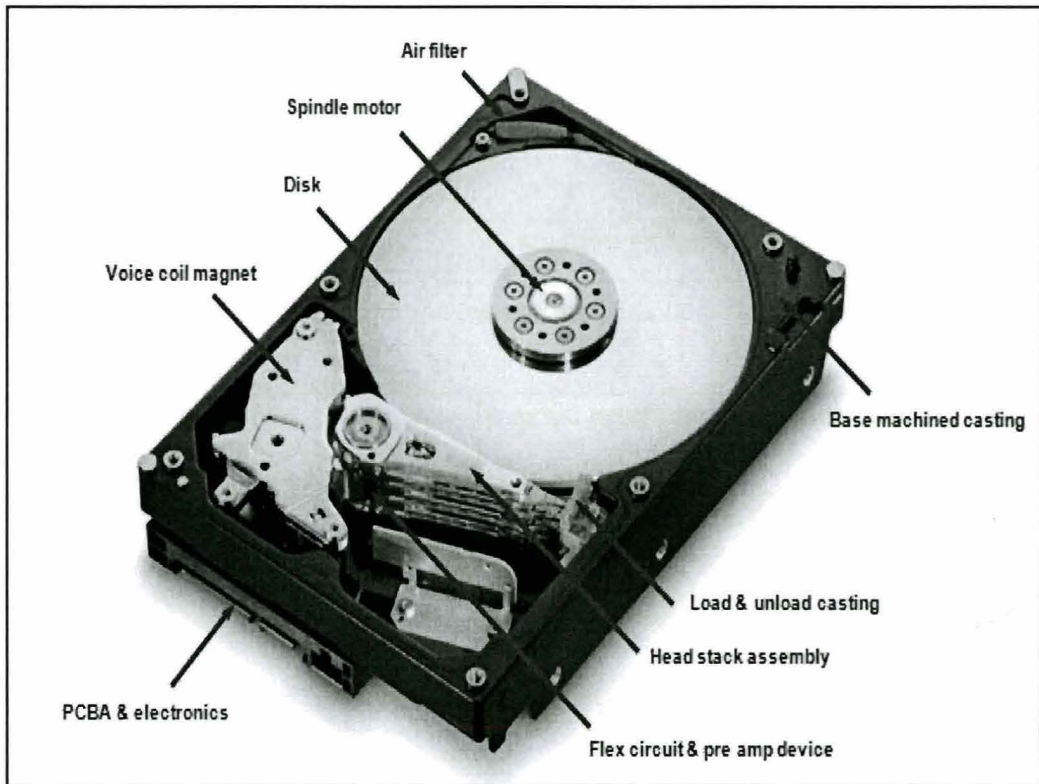


Figure 2.1: Hard Disk Drive

Table 2.1: Function of Main Components of A Hard Disk Drive

Component	Function
Air filter	To filter and absorb away particles
Spindle motor	Play an important role to spin the hard disk platter
Disk/Media	Information stored here. Made of aluminium or glass.
Voice coil magnet	To assist head stack on movement
Base machined casting	The case of hard disk drive
Load and unload casting	Protection against direct head and disk contact
Head stack assembly	Move the heads across the disk and position accurately for read/write
Flex circuit and preamp device	Amplify signals and controls head
PCBA	Consist micro controller unit and I/O for data transmission

2.2 Toyota Production System

Toyota Production System is the most systematic and highly developed example of what the principles of the Toyota Way can accomplish (Liker, 2004). Jimmerson *et. al*, 2005 also stated that Toyota Production System is the most powerful tools for efficient design and management of operations as it helps Toyota Motor Corporation from small truck maker to world's leading automaker. Since after then Toyota Production System became trademark of Japanese approach to modern manufacturing and Toyota corporate culture have been omitted by OEM around the world. According to Pardi (2007) Toyota Production System is a solution to any problem that had risen during Fordism crisis in 1970.

Toyota Production System principles and tools have been used in many applications in order to achieve improvements in customer center process, product and service in wide range of manufacturing and service industries. In United States Big Three auto makers also committed to implement Toyota Production System in their worldwide manufacturing operations after they understand the powerful of the system and made a serious efforts at its implementation (Liker, 1999). By using Single Minute Exchange of Die in Toyota Production System the set up time for 1000 ton press can reduced from four hours to one and half hours in Toyota (Shingo, 1985).

The “Toyota Production System House” diagram is not a just a set of technique but it is a system that work based on structure where the house is only strong if the roof, pillars, and foundation are strong.

Few elements at the roof which is the best quality, lower cost, shortest lead time and best safety. The outer pillars will have the just in time and jidoka. People and teamwork,